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February 18, 1994

RECEIVED
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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

BY MESSENGER

Mr. William F. Caton, Acting Secretary
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, D.C. 20554

Re: Competitive Bidding and Personal Communications Services, PP Dkt. No. 93-253, Gen. Dkt. 90-314

Dear Mr. Caton:

American Personal Communications ("APC"), pursuant to Section 1.1206(a)(2) of the Commission's Rules, 47 C.F.R. § 1.1206(a)(2) (1992), hereby notifies the Commission that on February 17, 1994 representatives of APC, including Daniel R. Vincent, Ph.D of the J.L. Kellogg Graduate School of Management at Northwestern University, met with Diane J. Cornell, Esq. of the office of Chairman Hundt; Brian F. Fontes, Ph.D of the office of Commissioner Quello; Lisa Smith, Esq. of the office of Commissioner Barrett; Evan R. Kwerel, Ph.D, Mr. John Williams, and Kent Nakamura, Esq. of the Office of Plans and Policy; Ms. Kathleen Levitz, Mr. Gerald P. Vaughan, Mr. John Cimko, Kelly Cameron, Esq. and David Krech, Esq. of the Common Carrier Bureau; and Mr. Ralph A. Haller, Chief, Private Radio Bureau.

The matters discussed in these meetings are contained in APC's written submissions in the above-referenced dockets and in the attached paper, which was distributed to the above-referenced staff members during these meetings as well as to Robert M. Pepper, Ph.D, Chief of the Office of Plans and Policy. Please direct any inquiries concerning this matter to the undersigned.

Very truly yours,

Kurt A. Wimmer

Attorney for American Personal Communications

cc: Diane J. Cornell, Esq.
Brian F. Fontes, Ph.D
Lisa Smith, Esq.
Robert M. Pepper, Ph.D
Evan R. Kwerel, Ph.D
Mr. John Williams
Kent Nakamura, Esq.
Ms. Kathleen Levitz
Mr. Gerald P. Vaughan
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The Myth of the Superior Auction Option

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Introduction

This paper is intended to serve two purposes. The first is to provide an overview of the main proposals for auction mechanisms that the FCC is currently considering. The second is to evaluate these proposals both on their intrinsic merit and on the private incentives that underlie the proponent's positions.

The essential disagreement on auction design is between those who support sequential auction design and those who support simultaneous auction design. It is clear on reviewing the proposals that there is intellectual merit to the arguments on both sides. Contrary to what some parties would have you believe, there is no terrible burden of academic theory the FCC will violate should it choose one mechanism over the other. Rather, the burden is for the FCC to devise a rational, uncomplicated auction that will insure the birth of this new industry, personal communications services, in a timely manner.

Major Issues/Major Conflicts

Included here is a description of the somewhat more abstract principles that are presenting themselves as the focus of debate. This abstraction is intended to develop a context in which the explicit proposals are later discussed.

Since there is no clear "best" auction design in practice, the FCC faces weighing the public policy tradeoffs implicit in the selection from among less than optimal options. As the FCC chooses among the different auction types, it must assess the public policy ramifications of the following:

- How each auction type affects efficient assembling multiple licenses;
- How much information is spread around through the process of the auction;
- How simple the auction is in practice to operate; and
- What operational difficulties might arise as a result of various auction types;

Assembling Multiple Licenses -- It is on this point that the parties, and in particular, their economists, are most agitated. This is an important issue because many companies believe that the value of holding a license in one region increases if they also hold licenses in other regions. The main source of the interdependence comes from the consumer demand for a service that will allow them to roam or to use their handset across regions. Most participants believe the ability to assemble multiple licenses as part of the auction process is important and, as such, the debate has centered substantially on how a particular auction mechanism affects the ability of a firm to obtain its most preferred bundle of licenses.

Information Sharing -- Some of the debate regarding assembling multiple licenses is also driven by concerns about information sharing. With the notable exception of NTIA, most economists believe that bidders could more accurately predict their valuation of a license if they could learn the predictions of other bidders (possibly in all regions). The most likely way of obtaining this information, short of industrial espionage, is to observe bids. Because the various auction mechanisms seem to have different implications for what is learned about bids, the different interpretations of how the mechanisms allow bids to communicate this information has generated much debate.

Simplicity of the Auction Mechanism -- All proponents agree with the NPRM's conclusion that any auction mechanism must not be too complicated. The dispute is over which auction is more simple to run, either with regard to the FCC's responsibilities or to the demands on the bidders. Unfortunately there are no theoretical results that the FCC can draw on to help distinguish the auction types. The economists' strong arguments for one or another auction, then, are not really based on any special knowledge, but on an intuitive sense about which is easier -- an intuition that has no greater claim to accuracy than that of other non-economists.

Major System Breakdown and Speed of Process -- While both system breakdown and speed of assigning licenses affect economic efficiency, they are, of course, also strongly political concerns. Any system failure undermines the revenue-generating potential and efficiency aspects of auctions. The FCC is facing a considerable unknown with vast potential

stakes. An unexpected event in the midst of an auction could lead to chaos, that would, at best, delay the auction for weeks or months, and at worst, subject its results to years of protracted litigation. In anticipating such scenarios, policymakers could envision that, for example, as the process is running, some (legal or illegal) manipulation of the mechanism is discovered that frustrates the aim of a fair allocation of the licenses; or that an unanticipated technical glitch arises; or that it becomes evident that some allocation of the license is patently inefficient or that the auction simply takes too long to complete.

Since this process has no directly relevant precedents, neither policymakers (nor the economists advising them) can draw on experience. Economists disagree over how closely some other markets, such as the securities markets or perhaps the auctions of OCS tracts, correspond to this situation. The relevance of experiments as a way to predict possible outcomes is a source of disagreement among economists, particularly about the reliability of small dollar amount experiments.

Review of the Major Proposals

The lines appear to be drawn mainly between Bell Atlantic and Pacific Bell's (PacBell) proposals. PacTel's proposal differs somewhat from that of PacBell, but it is fair to say they are more similar than different. Bell Atlantic, on the other hand, appears to have substantial support from the representations of TDS.

The primary issue where there is divergence is the simultaneous versus sequential auction. However, Bell Atlantic and PacBell also take different positions on the combinatorial versus individual license bidding systems. NTIA also has made a concrete proposal for a mechanism that exploits the process that CalTech devised over the past several years, and which it demonstrated in January. By virtue of its simultaneity, this proposal is closest to that of PacBell; however, as discussed below, it differs from the PacBell scheme in important ways.

Bell Atlantic

Description: Bell Atlantic describes its proposal as a mix of sequential and simultaneous auctions; however, the essential character of its proposal is its sequentiality. At the level of the individual license, the design proposed by their economists, Barry Nalebuff and Jeremy Bulow, is first to order the licenses by region. Participants for the A and B license in the first region enter an auction in which they indicate their participation either manually or electronically as an auctioneer starts with a low price and begins to raise it. Once a bidder drops out, he can not reenter.

The price is raised until some fixed number greater than two remain. (This number depends on the region, for example, ten for New York.) The auction is then temporarily halted. In the afternoon a similar process is begun for the next region, such as Los Angeles, and a further auction brings participants in New York down to six by raising the price. The next morning, New York is brought down to four and Los Angeles down to six. Finally in

the afternoon of the second day, New York is completed by raising the price until only two bidders remain. That price is the active price for one of the A - B licenses. The price continues to rise. The last bidder remaining pays the higher price, but has the right to choose between the two licenses. Other regions are then begun in a similar manner. The second region is completed and so on. Nalebuff-Bulow claim that the MTA's can be thus auctioned in two weeks. They claim that the remainder BTA's can be finished in a further three weeks.

In addition, Bell Atlantic has been lobbying for a nationwide license. Bell Atlantic suggests that an ascending price auction at the nationwide level precede the process described above. The price is to stop at a point at which only two bidders remain (the price continues to rise in order to determine the selling price for the most preferred block). For either A or B, if the sum of the individual licenses fail to exceed the nationwide license, then the nationwide bidder wins. Pursuing the issue of nationwide bidding, Nalebuff-Bulow also suggest that the eligibility rules be loosened for nationwide bidding. They suggest that the eligibility rules only apply to the use of the license, not to the bidding eligibility.

A interesting aspect of the Nalebuff-Bulow proposal is the proposed sequence of auctions. Nalebuff-Bulow suggest auctioning first Puerto Rico, Alaska and Hawaii, since it is reasonable to believe that assembling multiple licenses is not very important in any of these regions. This would provide some preliminary experience with the mechanism. They then suggest ordering the MTAs from largest to smallest and also to auction those farthest

apart first. For example, New York, Los Angeles, Chicago would be auctioned first. The perception is that the spillovers generating the desire to assemble multiple licenses go from large to small rather than the other way around.

Evaluation: The main advantage of the Bell Atlantic scheme is its simplicity. Any participant can envisage how the system operates and the system mimics fairly closely other market mechanisms which auction many goods.

There are two faults with the proposal, one major, the other minor. The major flaw is the nationwide bidding process. The Nalebuff-Bulow scheme would essentially have the FCC determine whether to allocate the license regionally or nationally by comparing the values of the second highest, rather than the highest, of each alternative. Nalebuff-Bulow suggest that this would be the "fair" way of addressing the free rider problem raised in the NPRM. However, this scheme has no theoretical justification underlying it. There are no efficiency grounds to justify allocating a license on the basis of second highest bids in the category.

The second, less profound, weakness may lie in the so-called Japanese auction scheme that Nalebuff-Bulow propose. Although there are definite advantages to a device which forces the price up exogenously, (it ensures that the auction proceeds rapidly and it reduces collusion), it also imposes a deadline on firms in which they must make potentially high stakes decisions.

Telephone Data Systems

Description: TDS's economist, Robert Weber, proposes an auction design closest to Bell Atlantic's. He agrees with the Nalebuff-Bulow suggestion of selling first the MTA licenses sequentially, followed by the BTAs. Weber suggests that simultaneous auctions could be experimented with at the BTA level but he remains skeptical. For the MTA regional sale, Weber disagrees slightly with Bell Atlantic in recommending that the A and B licenses be sold via simultaneous ascending bid auctions.

Weber differs from the Bell Atlantic economists in vehemently opposing the offering of combinatorial bids. The main grounds for this opposition are fears of post auction implications of a nationwide license holder. Weber also attacks the NTIA proposal for what he calls its severe complexity problems. He also argues that the sale of the designated licenses precede the E, F and G licenses so that bidders who are eligible for both would bid aggressively in both.

Evaluation: Weber's design is not much different from that of Nalebuff-Bulow, though the simultaneous ascending bid proposal does not suffer from either the weakness or advantage of the Japanese auction proposal of Nalebuff-Bulow.

Pacific Bell

Description: Pacific Bell's economists, Paul Milgrom and Robert Wilson, propose a scheme very different from Bell Atlantic's proposal. They suggest auctioning, simultaneously, all licenses by a mechanism which invites bids to be submitted daily. Bids are submitted on microdisk by 5 p.m. EST each day. Any bid that does not exceed the reserve price or the outstanding high bid by five percent (or five million dollars, whichever is smaller), is treated as no bid. Bidders may submit bids on any combination of licenses but the total number of licenses they may bid on is constrained by their past bidding behavior. Failing to submit serious bids can reduce the future eligibility of a bidder. Any bidder may only be active on an allowed level of MHz pops. This is determined first by the initial deposit, then by a formula depending on the phase of the auction and on previous activity levels.

The Milgrom-Wilson auction has three phases. In the initial phase, bidders' activity levels depend on their per pop deposits and then on their past activity. The activity level of an auction day is determined by the proportion of licenses (weighted by their population) that experienced serious bid increments. The second phase of the auction is entered when the activity level fails to exceed five percent in each of the previous two days of bidding. The third phase begins when this activity level does not exceed two percent in the previous two days. A bidder's activity in any round may not be higher than x times its activity level in the previous round where x is a multiplier associated with the phase of the previous round. ($x = \{3, 1.5, 1\}$). Thus, for example, in the first phase if a bidder is active on less than 1/3

of his eligible pops, such as 1/4, his eligibility falls to three times the activity level, or 3/4 of the original level. Bidders may acquire waivers if they did not receive one in either of the previous two rounds. A waiver allows the bidder to retain the previous round's activity level. It appears that bidders may enter or leave any range of auctions as long as they do not exceed their activity level. The auction is over when no license receives a serious bid increment. The high bidder in each auction wins the license and pays the price bid.

Evaluation: The Milgrom-Wilson scheme is among the most innovative proposals. However, it suffers from three weaknesses. The first is the complexity of the eligibility rule. It will be very difficult for firms and for the auctioneer to keep track of who is allowed to make what bids. This may end up allowing some firms to manipulate the system. The second weakness is the potential that this mechanism will take a long time. In order to maintain eligibility most participants are likely to submit the lowest possible bid, considerably slowing the process. In order for the Milgrom-Wilson scheme to operate at all quickly, the FCC would probably have to impose some sort of initial reserve price. Finally, the novelty of this scheme makes it vulnerable to complete system breakdown -- there is a real possibility of utter chaos and ultimately substantially more delay.

PacTel

Description: Preston McAfee's proposal mirrors the Milgrom-Wilson campaign for simultaneous auctions. There are only a few differences. McAfee does not recommend the extreme degree of simultaneity, opting instead for a division of license auctions into spectrum

blocks. The more important difference is the closing rule. McAfee recommends that each license close separately if the price fails to rise above a given increment. The Milgrom-Wilson scheme requires no license to close until the whole process has terminated. McAfee also wants to allow for more liberal bid withdrawal rules. In the initial Milgrom-Wilson proposal, any firm that defaulted on any bid would lose both its initial deposit and its eligibility for all other licenses. McAfee would allow defaults at only the deposit penalty. Milgrom and Wilson appear to have stepped back from the more severe penalty, making the difference between the two proposals less substantial. McAfee argues for a long period between bids, as much as three days.

Evaluation: The dispute between Milgrom-Wilson and McAfee over the penalties for bidder withdrawal inadvertently highlights a weakness in the simultaneous auction scheme. The proponents of this approach argue that it allows bidders both flexibility in terms of which regions they can concentrate on and transparency in terms of allowing information to travel back and forth across auctions. However, the two goals are in conflict and in the end show that this scheme encounters the same problems as sequential auction schemes. If there are no penalties for bid withdrawal, then any bid is difficult to interpret, and it has essentially no information contained in it. However, if bids cannot be withdrawn, the vaunted flexibility of the simultaneous scheme is severely limited.

NTIA

Description: The NTIA proposal is taken directly from an experimental design developed at Caltech to aid the Jet Propulsion Laboratory in allocating resources for the space shuttle. The mechanism is also a simultaneous ascending bid system in which participants are allowed the right to submit bids on bundles of licenses. Once a sequence of bids is received, the auctioneer must determine what bid proposals are feasible given the licenses available. Among the feasible bids, he then must determine which allocation yields the highest revenue. The current leading allocation is announced and participants are allowed to improve on it by submitting higher bids. The whole auction ends by a mechanism that is intentionally somewhat arbitrary and not fully described by the authors. A paper by Ledyard, Porter and Banks published experimental results on this auction with Caltech students as subjects and claimed that it i) operated smoothly and ii) outperformed other mechanisms.

Evaluation: There are a large number of caveats to this auction design. First, the scheme that Ledyard et al. tested was far simpler than any corresponding scheme would be for the FCC. Second, the higher efficiency performance was gained by allowing the participants to form cartels in order to beat out current high bids. It is far from obvious that the FCC would be willing to allow this potentially politically dangerous version. The eccentric ending rule is an obvious weakness. Another difficulty with the NTIA scheme is that important details of the auction procedure are not carefully specified. This gap could well lead to confusion and disorder on implementation.

Major Proposals in the Policy Context

In the end, any assessment of the various parties' proposals becomes a comparison of the simultaneous versus sequential auction choice. Over the past months, the simultaneous auction scheme has taken on the veneer of greater academic respectability. However, in all areas where the two alternatives are compared, the sequential scheme has as much theoretical support as the simultaneous scheme.

In many ways a modification of sequential auctions would in fact be the preferred auction design. The nationwide bid element of Bell Atlantic's proposal for sequential auctions detracts from its sequential proposal. The main competing alternative to the Bell Atlantic proposal is the Milgrom-Wilson simultaneous auction scheme, which is innovative, but complex in its eligibility rules. And, while interesting on an experimental basis, the NTIA proposal is extremely complicated, non-transparent in pricing rules, and without any real theoretical or (convincing) practical justification.

Ability to Assemble Multiple Licenses -- There is no doubt that the choice of order in the sequential auction imposes a non-market influence on how multiple licenses may be assembled. However, without full combinatorial bidding, any other scheme also imposes a non-market influence. The Milgrom-Wilson scheme imposes it through the eligibility rules. There are no theoretical models that illustrate conditions under which one scheme or another mitigates this cost and there are no empirical studies that would inform us in any case about the specifics of this environment.

Information Transfer -- Although there is little formal reasoning favoring one scheme or another, it seems that the discipline imposed by forcing bidders to bid or to lose the license certainly makes the sequential auction convey meaningful data. The cost is that the communication is primarily only one way -- from earlier auctions to later. On the other hand, the Milgrom-Wilson scheme encourages participants to hide their information as much as possible. The ability to hide information is hindered somewhat by the eligibility rules; however, the opportunity for participants to shift around from one license to another allows a great deal of play for dissimulation. While this proposal creates the channel for two-way communication of information, it reduces the incentive to provide meaningful information; thus much of its information-transfer benefits are illusory. Any attempt to force bids to be sincere, inevitably comes into conflict with the desire to allow flexible assembly of multiple licenses.

Simplicity -- The debate over the simplicity of the various proposals has often been misleading. The various parties argue over which mechanism forces participants to face the more complicated decision. In a sense, they all are the same. If 2600 licenses are open for bid in, for example, two months, then in a sense, the market as a whole will have to process the same amount of data in the same amount of time. The two proposals do have some differences though in how those demands are allocated. Suppose that the 102 MTA licenses are all to be sold in 102 days. In both proposals, that allows a bidder one day of decisionmaking for each license. If the market is made up only of bidders who want to bid on all licenses, there would be no total data processing differences of the two schemes.

However, if some bidders want only one specific license the data processing demands are different. In the Bell Atlantic scheme, a bidder who desires only one particular license would have only a day to complete the decisionmaking for his particular license. In the Milgrom-Wilson scheme, the auction for this license will stretch out for the full 100 days. In this sense, the Milgrom-Wilson process puts fewer demands on small bidders.

On the other hand, it is apparent that the Milgrom-Wilson scheme is in general a more complex device for bidders to understand. Bidders with fewer research resources but who are nevertheless interested in many possible licenses, face costs of a different type, the costs of assessing strategies. It also seems that the possibility of an overall system failure is greatest in the Milgrom-Wilson proposal.

Conclusion

It is interesting to note that at the heart of it, there is no body of knowledge sufficiently complete to allow economists to judge precisely which scheme is better or worse. Thus, it is intriguing that the proponents have taken such passionate and opposing stances. These are truly areas where well-intentioned and intelligent people can disagree, but the passion is no doubt attributable to the vested interests of the parties.

For Bell Atlantic, the interest in the nationwide bidding scheme is evident. This motive may explain the focus on the sequential bids. As noted above, one impact of the simultaneous bid system is to provide a slight temporal advantage to the small bidder

interested in a specific license. The consequence of course is to generate a bias in the simultaneous auction somewhat in favor of regional bids. Bell Atlantic has made it clear that it does not favor such a bias. Its proposal that the decision between nationwide or regional licenses be made on the basis of prices out of two second price mechanisms is also a modification geared to favor the nationwide bids. Originally, the NPRM suggested a comparison of first price bids from the nationwide process with something approximating a second price scheme at the regional level. The NPRM contained two biases -- one in favor of the nationwide bidders and one against. Bell Atlantic's proposal simply eliminates the one against the nationwide bids.

The similarities between PacTel and PacBell's bids are probably no coincidence. The simultaneous bidding system suggests two potentials for bias. PacBell appears not to be interested in a nationwide license. It also may wish to establish a spotted national presence and is concerned that arbitrary ordering of sequential sales by the FCC will frustrate that aim. Furthermore, the larger, better-funded bidder might be advantaged by the complexity of the simultaneous auction schemes, where the information transfer possibilities are slim. PacTel and PacBell may be very interested in reducing the ability of other smaller firms from free riding on their research through observing their bids.

There is no clear winning proposal. The decision that the FCC makes must be in the context of achieving its desired policy outcomes, maintaining simplicity, and, in particular, realizing the timely introduction of personal communications services.

CURRICULUM VITA – October, 1993

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PERSONAL

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EDUCATION

B.A., University of Toronto, 1981
B.A., Merton College, Oxford University, 1983
Ph.D., Economics, Princeton University, 1987

THESIS TOPIC

Strategic Interaction In Dynamic Trading Games: Three essays in non-cooperative game theory

MAJOR FIELDS OF INTEREST

Microeconomic Theory
Mathematical Economics/Game Theory/Auction Theory/Bargaining Theory
International Trade

FELLOWSHIPS

Rhodes Scholarship, Oxford, October, 1981 to August, 1983

Princeton University Fellowship, September, 1983 to June, 1985

Social Science and Humanities Research Council Doctoral Fellowship, June, 1985 to September, 1986

Alfred P. Sloan Doctoral Dissertation Fellowship, September, 1986 to August, 1987

PROFESSONAL APPOINTMENTS

Visiting Assistant Professor, California Institute of Technology, 1992-1993

Assistant Professor, (Microeconomics, Mathematical Economics, International Economics), J.L. Kellogg Graduate School of Management, 1987 – to present

Teaching Assistant (Introductory Microeconomics and Graduate Microeconomic Theory), Princeton University, 1984, 1986

Research Assistant, Bank of Canada, Ottawa, 1984

PUBLICATIONS

"Bargaining With Common Values," *Journal of Economic Theory*, vol. 48. no. 1, June, 1989.

"Dynamic Auctions," *Review of Economic Studies*, 57 (1), January, 1990.

"Delayed Agreements and Non-expected Utility," (joint with Chaim Fershtman, Zvi Safra), *Journal of Games and Economic Behavior*, 3, 1991.

"Updating the Reserve Price in Common Value Auctions," (joint with R. Preston McAfee), *American Economic Review, (Papers and Proceedings)*, 82, May, 1992.

"The Declining Price Anomaly," (joint with R. Preston McAfee), *Journal of Economic Theory*, vol. 60, no. 1, June, 1993 .

"Modelling Competitive Behavior," *Rand Journal of Economics*, Winter, 1992 .

OTHER PAPERS

"Bilateral Monopoly, Nondurable Goods and Dynamic Trading Relationships," CMSEMS DP No. 832, May, 1989.

"Optimal Procurement Mechanisms," (joint with Alejandro Manelli), under submission.

"Price Regulation and Quality of Service," (joint with Morton Kamien), CMSEMS DP. No. 920, Feb. 1991.

"Principals and Partners: The Structure of Syndicates," CMSEMS DP No. 909, January, 1991.

"Bidding off the Wall: Why Reserve Prices are Kept Secret," CMSEMS DP. No. 838, July, 1989, under submission.

"Collusive Bidding in Hostile Takeovers," (joint with R. Preston McAfee, Michael A. Williams, Melanie Williams Havens), 1992.

"Repeated Signalling Games and Dynamic Trading Relationships" under submission.

WORK IN PROGRESS

"Empirical Implications of Auction Theory," (with R. Preston McAfee), work in progress.

SERVICES

1989-1991: Organizer of the Math Center Visiting Speaker Seminar Series, Northwestern University.

Referee for *Quarterly Journal of Economics, Review of Economic Studies, Journal of Economic Theory, Journal of Games and Economic Behavior, Rand Journal of Economics*, National Science Foundation, *Econometrica, American Economic Review, Journal of Industrial Economics.*

RECENT VISITS AND PRESENTATIONS

Conference on the econometrics of imperfect competition, Toulouse, 1992.

Canadian Economic Theory Conference, Montreal, 1992.

Visitor, Rheinische Friedrich-Wilhelms-Universitat Bonn, July, 1991.

Visitor, "Summer in Tel Aviv," Tel Aviv University, July-August, 1990.